STATE OF CALIFORNIA AIR RESOURCES BOARD

MONITORING AND LABORATORY DIVISION

QUALITY ASSURANCE SECTION

VOLUME V

AUDIT PROCEDURES MANUAL

FOR

AIR QUALITY MONITORING

APPENDIX A

PERFORMANCE AUDIT PROCEDURES

USING

AMBIENT LEVEL CYLINDERS

AUGUST 1983

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APPENDIX A. 1

PERFORMANCE AUDIT PROCEDURES

USING

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A.1.0 PROCEDURE

A.1.0.1 Introduction - Auditors use compressed gas cylinders of ultrapure zero air and ambient levels of carbon monoxide (CO), total hydrocarbons (THC), sulfur dioxide (SO2), nitric oxide (NO), and nitrogen dioxide (NO2) to conduct performance audits. Gas concentrations of these audit standards are traceable to National Bureau of Standards, Standard Reference Materials. See Volume I of this Manual for standards traceability protocol. Ambient level concentration compressed gas cylinders can be used until the cylinder pressure reads 500 psig.

Using a capillary controlled flow panel with a bypass flow meter, auditors feed the audit gas to the analyzer through the sample inlet line (Figures A.1.0.1 and A.1.0.2 of this Volume). This procedure insures that the audit gas is sampled in the same fashion as the ambient air. Certain CO analyzers may have to have their vacuum pumps turned off due to the large flow rates; however, the audit gas must still be fed through the normal sampling train. Normally, zero and up to four upscale concentrations covering the full analyzer operational range, are used (see the Federal Register 40 CFR Part 58 Appendix A or Volume I of this Manual). The analyzer response, corrected for zero shifts and calibration factors, is compared to the audit concentration at each audit point for computing data accuracy statistics.

Environmental Protection Agency (EPA) regulations for Air Quality Surveillance and Data Reporting, require that the audit results be calculated to represent the accuracy of each individual analyzer. Quarterly, and again annually, individual analyzer accuracies are used to determine a reporting organization data accuracy estimates. Volume I of this manual contains detailed procedures for making the calculations and preparing those reports.

A.1.0.2 Preaudit Inspection - If necessary, conduct a preaudit inspection of the monitoring site. Details concerning the preaudit inspection are given in Section 5.0.2.3 of this Volume. Special equipment needs should be noted on the preaudit inspection report.

A.1.0.3 Equipment - The basic equipment required for performance audits is listed below. Other equipment may be required depending upon the particular requirements of a site or analyzer.

1. Audit flow control panel (see Figure A.1.0.1 and A.1.0.2) designed to deliver compressed audit gas concentrations to analyzers in the same fashion as ambient air samples.

2. Compressed gas standards of concentrations necessary to meet EPA's required audit range (see EPA's 40 CFR Part 58, Appendix A or Volume I of this Manual). The minimum assay frequency of the compressed gas standards shall be:

   a. Three cylinder assays (two preaudit and one post audit) are required to determine a gas standard's mean value.

   b. Ultrapure zero air cylinders require a preaudit assay against laboratory zero air.

3. Specific regulators, fittings, and Teflon* lines, dedicated to each pollutant.

4. The following test equipment with calibration frequencies meeting or exceeding those presented in EPA guidelines are required:

   a. Digital volt meter with A/C adapter and test leads.

   b. An NBS certified precision thermometer.

   c. A Vol-o-Flo laminar flow measuring device (0 to 3 liters), or equivalent.

5. Audit log book and forms.

6. A tool kit.

7. Spare parts (stainless steel fittings, Teflon lines, etc.).

A.1.0.4 Audit Log Book and Report Form Entries - Record the audit information as required in Section S.0.2.5.

A.1.0.5 Equipment Setup

1. Prepare the flow control panel. Select and install the appropriate capillary to provide approximately 1.2 times the analyzer flow demand (see Figure A.1.2.2).

2. Connect the CGA 590 pressure regulator to the ultrapure air cylinders. Connect the ultrapure air cylinder to the flow control panel.

3. Connect the digital volt meter in parallel with the analyzer's signal output. If possible, use the volt meter's AC adapter to conserve the internal battery.

- Trade mark - DuPont Corporation

4. If an analyzer draws its sample from a sampling manifold, disconnect the analyzer's sample inlet line from the sample manifold port. Connect the audit sample line to the analyzer's sample inlet port. Plug the open sample manifold port to prevent room air from entering the manifold. Several analyzers may be audited at one time.

5. If an analyzer draws its sample directly from the ambient air via a sample inlet line, disconnect at the analyzer inlet and connect the audit line directly to the analyzer's sample inlet port.

A.1.0.6 Audit Procedure

1. Connect the calibrated Vol-o-Flo to the sample inlet line of the analyzer to be audited. Determine and record the sample flow rate in the audit log book on the preliminary audit report form.

2. Disconnect the Vol-o-Flo and connect the inlet line from the flow control panel to the analyzer's inlet port (see Figures A.1.2.1 and A.1.2.2). Using the zero air cylinder's second stage pressure regulator, adjust the pressure until a flow corresponding to approximately 100 sccm is shown on the bypass flow meter of the flow control panel. CAUTION: Even though bypass flow is indicated on the bypass flow meter there could be a leak in the flow panel downstream of the flow meter. Therefore, always make sure all fittings are tightened and leak free before conducting the audit. Obtain a stable analyzer output of no less than 10 minutes duration. The audited agency's staff shall determine when a stable output is obtained and shall provide the auditor with the value of the analyzer's response to the audit gas. Record the value as reported by the air monitoring staff member and the digital volt meter reading in the audit log book and on the preliminary audit report form.

3. Disconnect the ultrapure zero air cylinder from the flow panel and the zero air inlet line from the analyzer. Correct the appropriate pollutant gas line coming from the panel to the analyzer's sample inlet. Attach the designated pressure regulator to the highest level ppm audit standard cylinder. Connect the audit cylinder to the appropriate inlet of the flow control panel. The inlets and sample lines are marked to denote the pollutant to be used with each channel. Do not

swap regulators, sample lines, capillaries or bypass flow meters between pollutants. Verify that the cylinder pressure is 500 psi. Adjust the pressure regulator until a flow of approximately 100 sccm is shown on the bypass flow meter. After the air monitoring staff member determines that the analyzer response is steady, record the reported value and the digital volt meter reading in the audit log book and on the preliminary audit report form.

4. Repeat Step 3 with other compressed gas cylinder concentrations as required by EPA (see 40 CFR Part 58 Appendix A or Volume I of this Manual).

5. Remove the audit standard from the inlet line and reconnect the sample inlet to the manifold. Verify that each audit cylinder's control valve is fully closed.

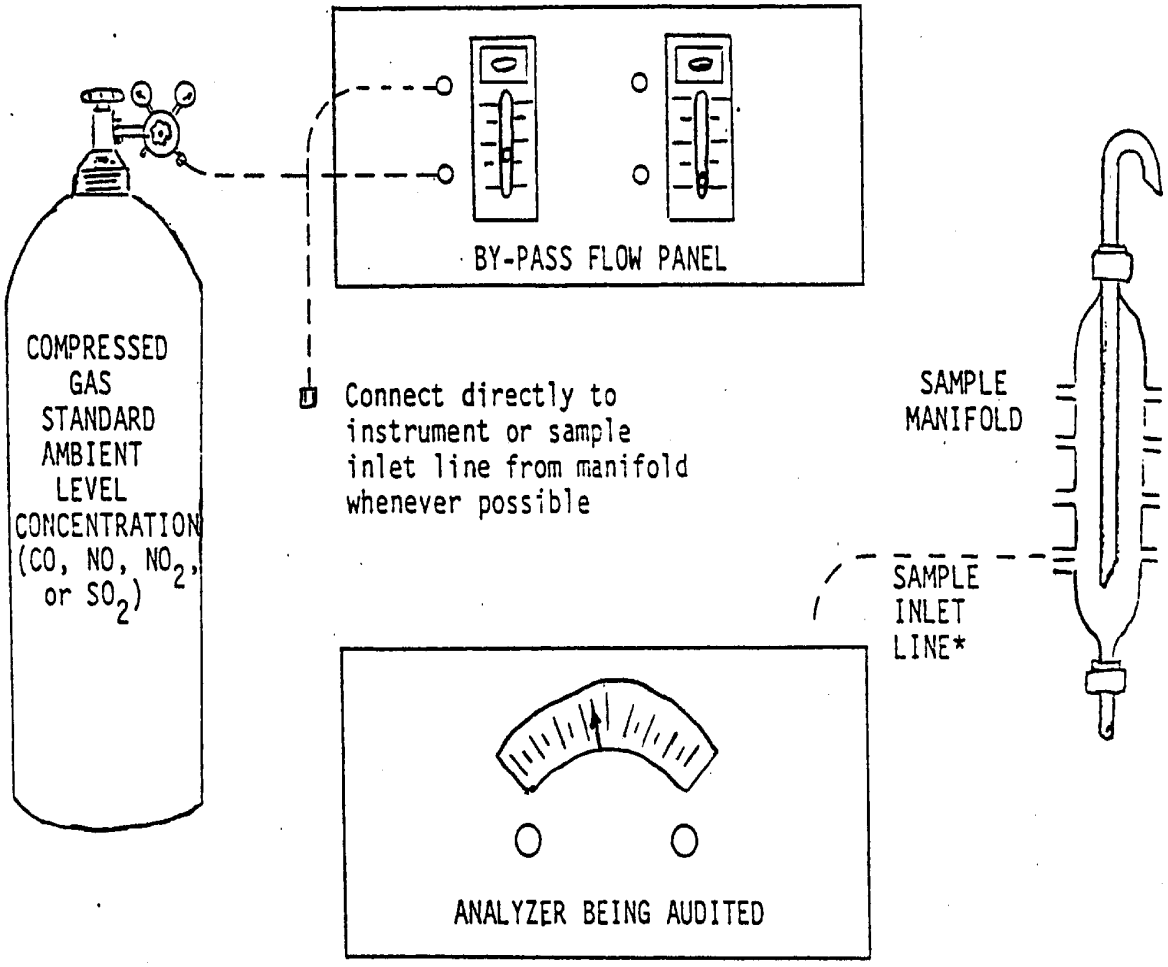
6. Remove the equipment from the site as you complete the equipment inventory sheet.

A.1.0.7 Data Handling

1. Transmit the data from the log book to the Single Continuous Analyzer Audit/Accuracy Report and calculate the audit statistics.

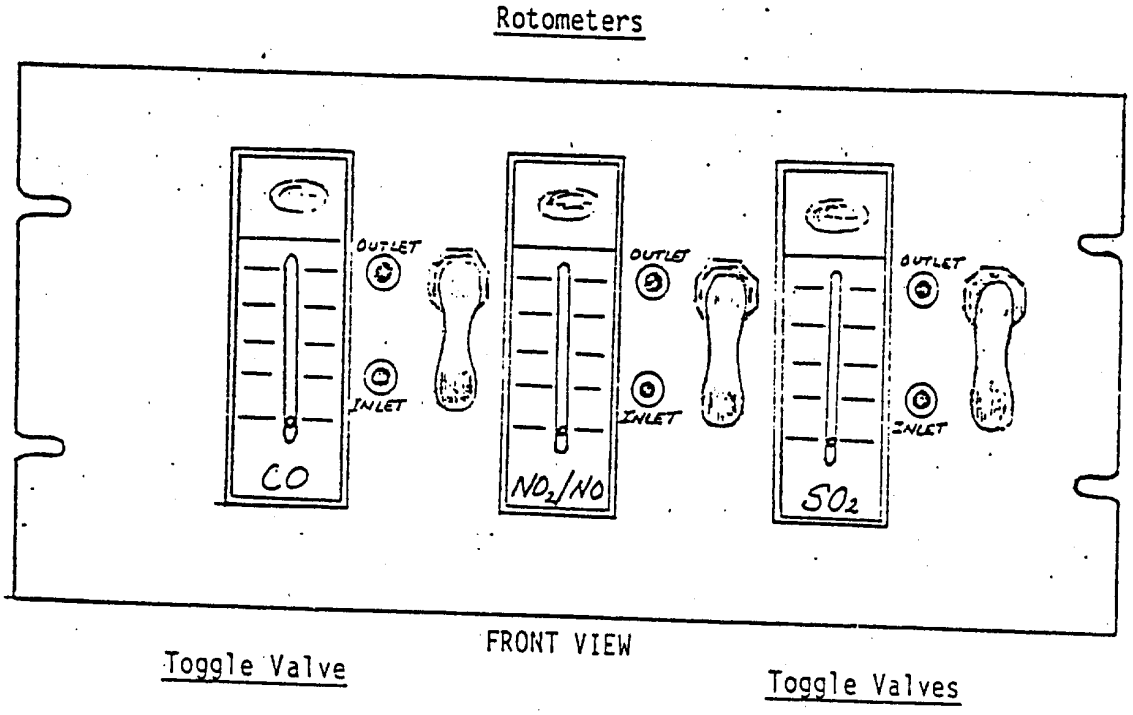
2. After the results are calculated, have an independent check of your calculations.

3. Send copies of the Single Continuous Analyzer Audit/Accuracy report to the ARB quality assurance coordinator after the completion of the audit. Note on the report that the results are preliminary. After the final report is complete, file a copy of the accuracy report in the ARB-QA file.



*The sample inlet line is attached to the sample manifold or goes directly to ambient air.

Figure A.1.0.1
Compressed Gas Hookup



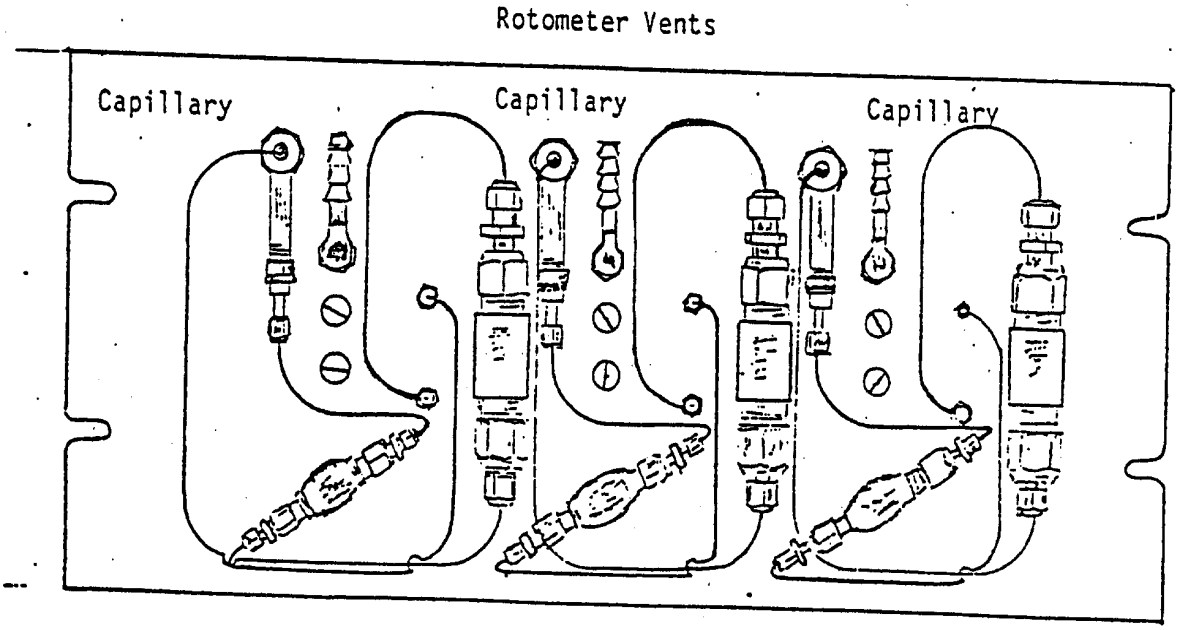


Figure A.1.0.2
Flow Control Panel